

Effects of the nanostructure and nanoporosity on bioactive nano-hydroxyapatite/collagen by electrodeposition

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摘要

Abstract

Hydroxyapatite (HA)/collagen composites were reported to induce bony growth. Various methods for preparing HA-based composites have been investigated as potential biomaterials for bone substitutes. However, no method can generate a thick nanoporous HA. A novel bone regenerative nanocomposite consisting of nano-hydroxyapatite (HA), nano-amorphous calcium phosphate (ACP) and reconstituted collagen by electrodeposition was designed in this research. Specimens with and without nanoporosity were evaluated using electrochemical measurements, material analyses, and cell-material interactions. The results showed that reconstituted collagen/nano-(HA and ACP) illustrated a multinanoporous structure and enhanced biocompatibility. Nanocomposite was comprised to nano-(HA and ACP) and reconstituted collagen. The core cell structure was formed during electrodeposition. Nanoporosity and nanostructure were observed as formation of nanocomposite. The nano-(HA and ACP) phases were essentially composed of a nanoporous and nanostructural biocomposite. Reconstituted collagen incorporation with the nanoporous and nanostructural biocomposite significantly facilitated the osteogenic differentiation of mesenchymal stem cells. Reconstituted collagen was covered with nano-(HA and ACP), profoundly impacting the enhancement of biocompatibility on application of implant and tissue engineering. The bioactive nano-HA/reconstituted collagen-induced osteogenic differentiation of mesenchymal stem cells enables to enhance bone growth/repair and osseointegration. © 2009 Wiley Periodicals, Inc. *J Biomed Mater Res* 2009